

3.5 Transformations of Exponential Functions - Worksheet

MCR3U

Jensen

1) Describe the transformations that map the function $y = 2^x$ onto each of the following functions...

a) $y = 2^x - 2$

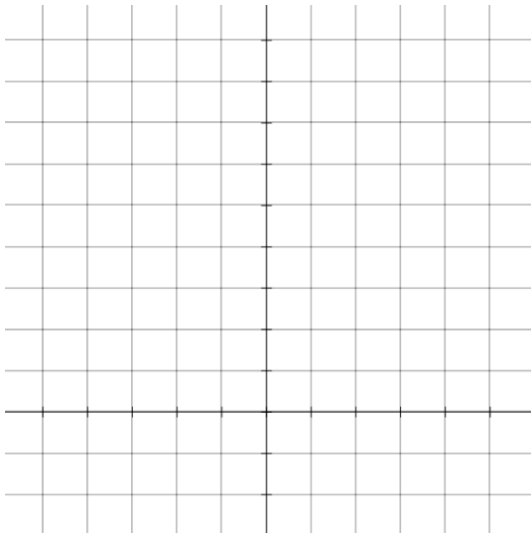
b) $y = 2^{x+3}$

c) $y = 4^x$

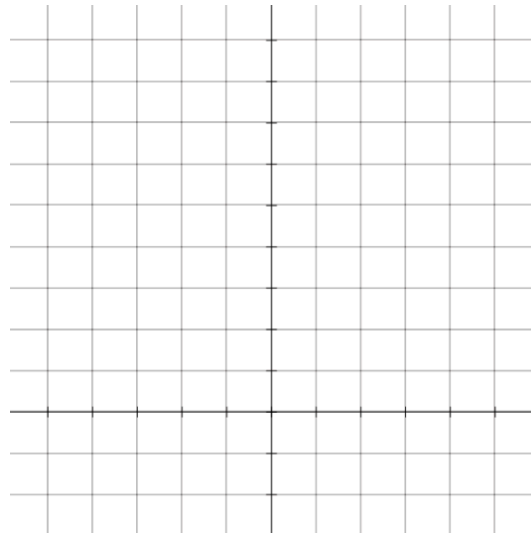
d) $y = 3(2^{x-1}) + 1$

2) Create a sketch of each graph for each equation in question 1. (a table of values may help)

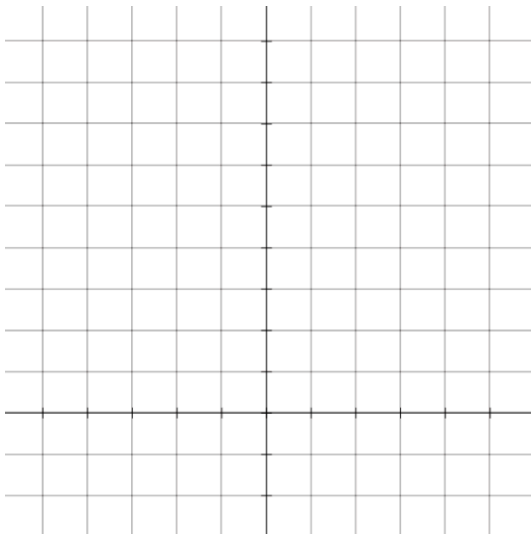
a)



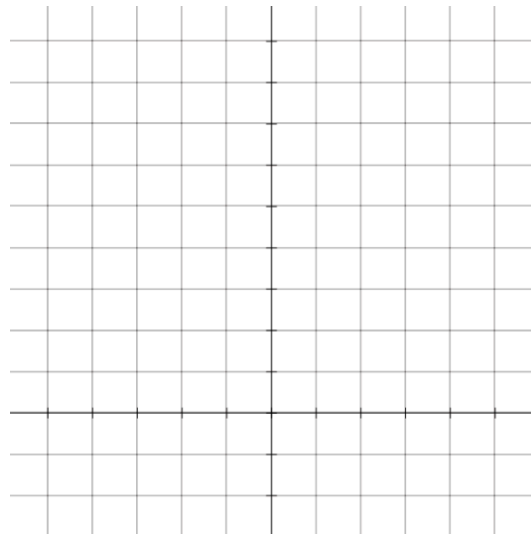
b)



c)



d)



3) Write the equation for the function that results from each transformation applied to the base function $y = 5^x$.

a) translate down 3 units

b) shift right 2 units

c) translate left $\frac{1}{2}$ unit

d) shift up 1 unit and left 2.5 units

4) Describe the transformations that map the function $y = 8^x$ onto each function.

a) $y = \left(\frac{1}{2}\right) 8^x$

b) $y = 8^{4x}$

c) $y = -8^x$

d) $y = 8^{-2x}$

5) Write the equation for the function that results from each transformation applied to the base function $y = 7^x$

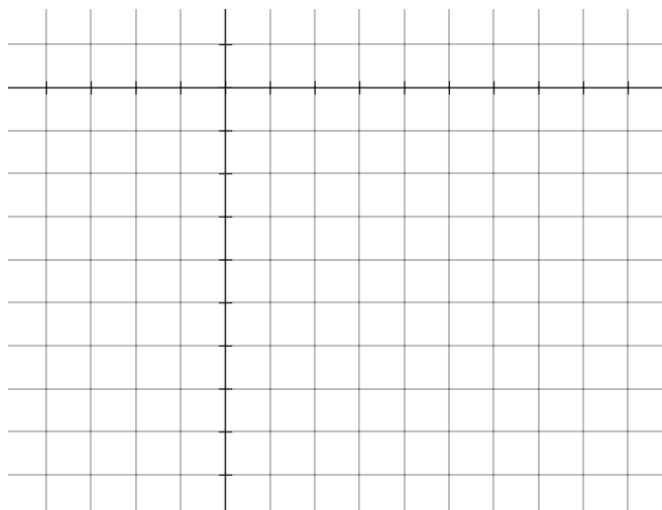
a) reflect in the x-axis (vertical reflection)

b) stretch vertically by a factor of 3

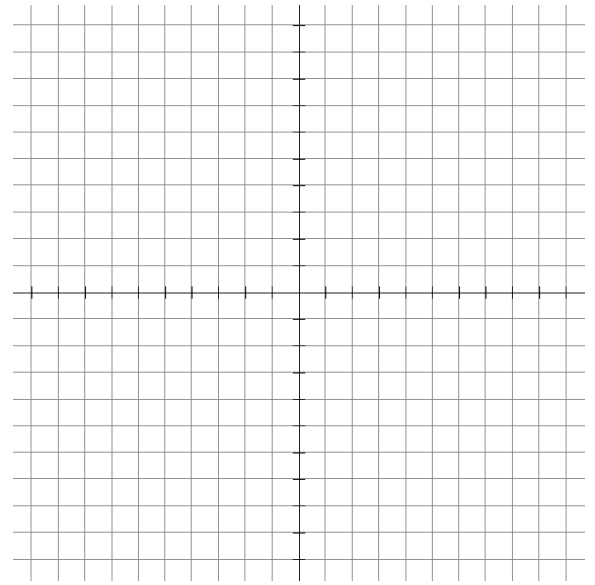
c) stretch horizontally by a factor of 2.4

d) reflect in the y-axis and stretch vertically by bafo 7

6) Sketch the graph of $y = \left(-\frac{1}{2}\right) 2^{x-4}$ by using $y = 2^x$ as the base and applying transformations.



7) Sketch the graph of $y = 3^{-0.5x-1} - 5$ by using $y = 3^x$ as the base and applying transformations.

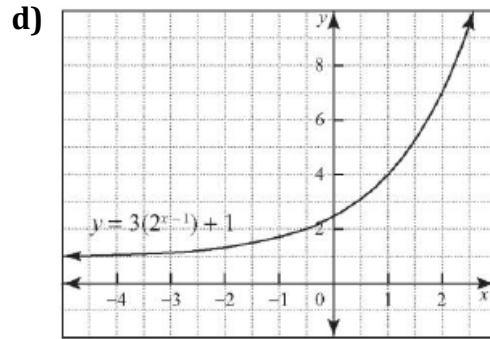
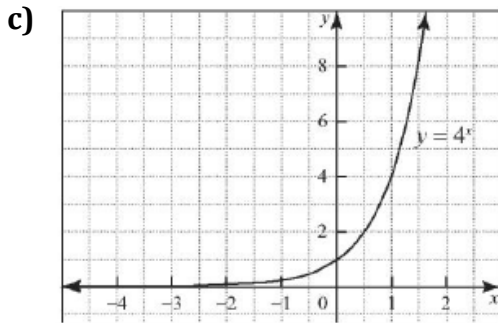
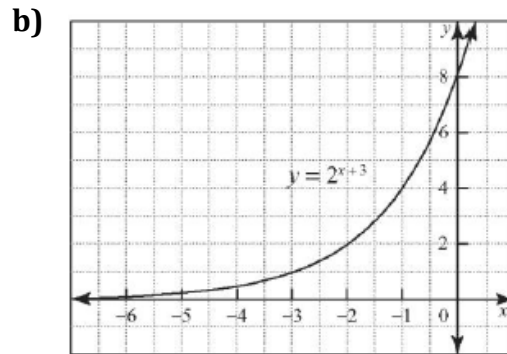
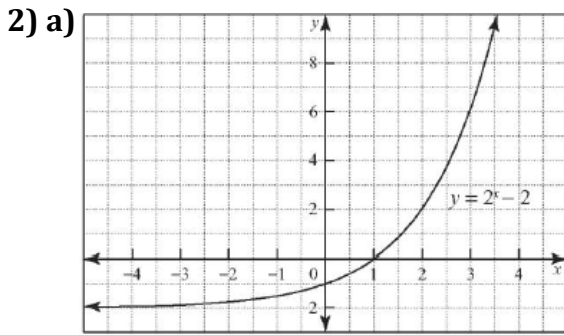


8) a) Rewrite $y = 9^x$ using a base of 3. Describe how you can graph this function by transforming the graph of $y = 3^x$.

b) Rewrite $y = 9^x$ using a base of 81. Describe how you can graph this function by transforming the graph of $y = 81^x$.

Answers

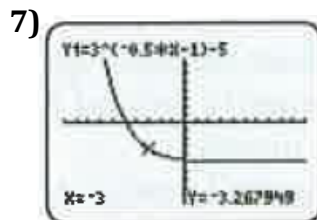
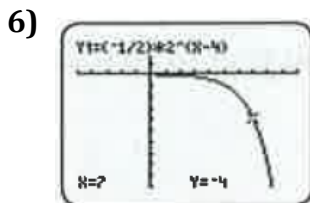
- 1) **a)** translate 2 units down **b)** translate 3 units left **c)** horizontal compression by a factor of $\frac{1}{2}$
d) vertical stretch by a factor of 3, a translation 1 unit to the right and 1 unit up



- 3) **a)** $y = 5^x - 3$ **b)** $y = 5^{x-2}$ **c)** $5^{x+\frac{1}{2}}$ **d)** $y = 5^{x+2.5} + 1$

- 4) **a)** vertical compression by a factor of $\frac{1}{2}$ **b)** horizontal compression by a factor of $\frac{1}{4}$
c) vertical reflection (reflection in the x-axis)
d) horizontal reflection (reflection in the y-axis) and horizontal compression by a factor of $\frac{1}{2}$

- 5) **a)** $y = -7^x$ **b)** $y = 3(7^x)$ **c)** $y = 7^{\frac{x}{2.4}}$ **d)** $y = 7(7^{-x})$



- 8) **a)** $y = 3^{2x}$; horizontal compression of the graph of $y = 3^x$ by a factor of $\frac{1}{2}$

- b)** $y = 81^{\frac{1}{2}x}$; horizontal stretch of the graph of $y = 81^x$ by a factor of 2